1,10-Phenanthrolinium Ionic Liquid Crystals

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Ionic liquid crystals are of great interest because they combine the properties of ionic liquids and liquid crystals. A wide variety of ionic liquid crystals has already been investigated, mostly quaternary ammonium, imidazolium and pyridinium salts.(1) Liquid-crystalline behaviour induced by ionic self-assembly is strongly dependent on both cation and anion. In this research a new cationic core, namely 1,10-phenanthrolinium, was combined with dodecylsulfate (DOS) and dioctylsulfosuccinate anions (DOSS), as shown in figure 1 and 2. The choice of these anions was based on previous research in which they proved to induce and stabilize mesophases and to lower melting temperatures significantly. (2)

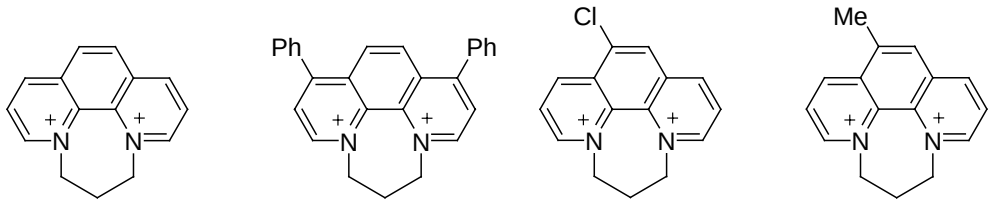

Figure 1: Overview of cations.

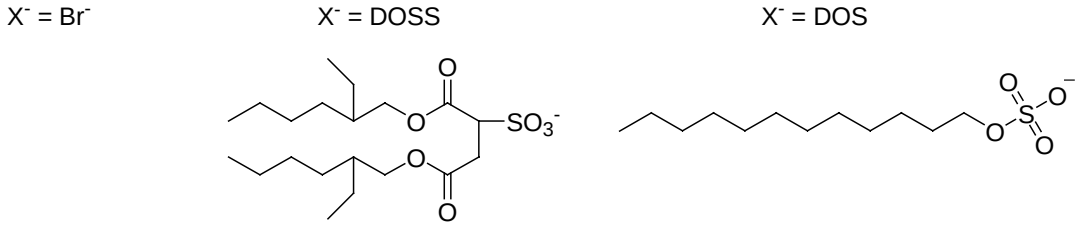

Figure 2: Overview of anions.

The thermal properties of all the 1,10-phenanthrolinium compounds were examined by polarising optical microscopy (POM), differential scanning calorimetry (DSC), and for some compounds by X-ray diffraction on powder samples (PXRD). The DOSS salts showed smectic A phases, whereas for the DOS salts the formation of a highly ordered smectic E phase was observed. Highly ordered smectic phases are not uncommon in ionic liquid crystals, as previously reported.(2,3) The mesophase temperature range was about 95 °C for all mesomorphic DOSS salts. The DOSS salts showed much lower melting points compared to the DOS salts. This is because the two branched alkyl chains disturb the packing within the smectic layers.

References

1. K. Binnemans, *Chem. Rev.* **2005***, 105*, 4148-4204.
2. K. Goossens, K. Lava, P. Nockemann, K. Van Hecke, L. Van Meervelt, K. Driesen, C. Görller-Walrand, K. Binnemans, T. Cardinaels *Chem. Eur. J.* **2009**, 656-67.
3. K. Lava, K. Binnemans, T. Cardinaels, *J. Phys. Chem. B*, **2009**, 9506-9511.